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ABSTRACT

This document summarizes the findings of the Second International Mathematics Study relative to calculator and computer usage by students in 20 countries. Two target populations were identified. The data on these two populations were provided by three basic questionnaires: (1) a school questionnaire; (2) a teacher questionnaire; and (3) a student questionnaire. Five major findings emerged: (1) Population B students (12th graders) use calculators and computers more than do Population A students (8th graders); (2) within Population B, Sweden and Ontario (Canada) make greater use of calculators than other countries while the United States, Sweden and New Zealand make greater use of computers than other countries; (3) school policies encouraging the use of calculators are more in evidence in Population B than in Population A, yet a very high percentage of schools have no policy in this regard; (4) Population A students use calculators mainly at home for homework, checking answers and recreation while Population B students use them both at home and school mainly for problem solving and doing homework; and (5) Population B students had more positive attitudes towards the use of calculators and computers than Population A students. (PK)

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Second International Mathematics Study

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The Uses of Calculators and Computers in Mathematics Classes in Twenty Countries: Summary Report

Center for Education Statistics
Office of Educational
Research and Improvement
U.S. Department of Education

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Second International Mathematics Study

The Uses of Calculators and Computers in Mathematics Classes in Twenty Countries: Summary Report

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Appendix I - Sample Sizes for Schools, Teachers and Students

1. Introduction

As a part of the Second International Mathematics Study, data were collected on calculator and computer use in schools in twenty countries. In the Study, two target populations were identified:

> Population A: All students in the grade in which the majority of students had attained the age of 13.0-13.11 years by the middle of the school year (for the USA this was the eighth grade).
>
> Population B: All students who are in the normally accepted terminal grade of the secondary education system, and who study mathematics as a substantial part of their academic program (students in twelfth grade college preparatory mathematics in the USA).

It should be noted that Population A, by definition, includes a broad cross-section of students. It specifies that all students in the grade are targeted for study. By contrast, Population B is a very selective group. It includes only those students who have continued their study of mathematics through to the end of secondary school. This is the "mathematics specialist" group of students and includes as few as 6 percent of the age group in some countries (e.g. England and New Zealand.) In other countries, such as Canada (British Columbia) and Hungary, this proportion is as large as 30 percent and 50 percent, respectively.

The two target populations also differ considerably in age. Population A students are typically 13 years of age at the middle of the school year. (However, for two countries, Japan and Hong Kong, twelve year olds were selected.) Population B students, on the other hand, are typically 17 years of age, with students in some countries (e.g. Sweden and Finland) having mean ages as high as 19 years.

The data on these two populations were provided by three basic questionnaires for each Population: 1) a school questionnaire, 2) a teacher questionnaire, and 3) a student questionnaire. The sample sizes are given in Appendix I.

Note: The data are in terms of the percentage of the total sample reporting (not the percentage of only those responding). Since there were in many cases high non-response rates, interpretation of the findings must be done with care.

A study as large and comprehensive as the Second International Mathematics Study includes not only the different target populations but vastly different cultural settings. For example, the Study included advanced industrialized countries such as Japan and the United States, together with developing countries such as Thailand and Nigeria. It was expected that such differences in the nature of the target populations, together with contrasts in culture and technological development, would lead to variations in the use and role of calculators and computers in schools as well as other educational policies and practices. It was found, for example, that calculator usage was much higher in general for Population B than for Population A. (That is, calculator usage is much more established in advanced school mathematics classes than at the lower secondary school level.)Differences were also found between countries at the same grade level. For example, Sweden and Canada (Ontario) make heavy use of calculators while Japan and Hungary make little use of the devices, even at the Population B level. With respect to computers, even less use was made than was made of calculators.

Students were found to have generally positive attitudes towards calculators and computers. This favorable outlook was found in all countries, and was more positive in the advanced classes than at the lower level of the secondary school.

2. Comparative Use of Calculators and Computers in Populations A and B

Overall, much more use is made of calculators in Population B than in Population A. Note, for example, the data in Table 1. For Population A, teachers report a median of only 6 percent using calculators frequently (one or more periods per week) across all countries. This usage ranged from a low of zero for Finland and Thailand to a high usage of 10 percent in Canada (Ontario) and Sweden with 11 percent reported in Nigeria. Figures 1 and 2 show this pattern quite clearly.

It was also found that much greater use is made of calculators among Population B in some countries than in others. Sweden (95 percent) and Ontario, Canada (78 percent) made frequent use of calculators while in Japan no teacher reported frequent use and 92 percent reported never using calculators (88 percent never use and 4 percent not allowed). In Hungary and Thailand only 4 percent and 8, respectively, report frequent use and 32 percent and 27 percent report never using calculators. Hong Kong also reported fairly limited frequent use (22 percent) but 46 percent of the teachers there reported occasional use of calculators. The remaining countries were near the international median of 53 percent. Only in Sweden, USA and New Zealand do more than 10 percent of the Population B students report using a computer in their classes (the USA reports the highest use of the computer in other classes and Sweden reports the highest use in mathematics classes). For all other countries the use of computers in classes or even at home is reported as being almost negligible. This pattern is shown in Figure 2.

Of interest is the fact that in Israel 53 percent of the mathematics teachers indicated frequent use of the programmable calculator in class whereas no students reported using these devices (or any sort of calculators) in class.

3. School Policies

The data from the schools questionnaire (Table 2 and Figures 3 and 4) indicate that in most of the countries the use of a calculator is forbidden in a large number of schools. Only limited use is made of the calculator in most of the other schools. An exception is Sweden where 25 percent of the schools make frequent use and 40 percent limited use of the calculator. In only 1 percent of the Swedish schools is the use of the calculator forbidden. In Japan and New Zealand about a third of the schools provide calculators yet the calculators are still rarely used.

Among Population B schools only Japan (12 percent) forbids the use of calculators in more than 10 percent of the schools. The USA has the highest percentage of schools that have no policy regarding calculators (56 percent - international median = 20 percent). In Thailand 27 percent of the schools indicate unavailability. For all other countries the percentage reporting unavailability of calculators is 11 percent or less. In Sweden 79 percent of the schools indicate frequent use of the calculators which are provided by the school and in Flemish Belgium the percentage is 34 percent. All other countries report less than 20 percent of the schools make frequent use of the calculator. Ontario, Canada, England and Wales, New Zealand, and Scotland all report that limited use is made of the calculator (it is either not provided but permitted or provided and rarely used).

4. Uses Made of Calculators

The data on place of use for calculators are contained in Table 3 and shown in Figures 5 and 6. For Population A students only Ontario, Canada; Sweden; and the USA report as many as 25 percent use calculators in mathematics classes. Thirty percent or more of students in the USA, Sweden, New Zealand, Luxembourg, Israel, England and Wales and Ontario, Canada report no use made of calculators. This may not be an accurate picture. There was a very high non-response rate and thus it is likely that the percentage were even higher and were probably high for many of the other countries as well. More than 30 percent of the students in Scotland, New Zealand, Netherlands, Luxembourg, Japan, Hong Kong, France, England and Wales, Ontario, Canada and French Belgium reported using calculators at home.

For Population B, it was found that in Hungary (61 percent) had a high percentage reporting non-use of calculators. Over 40 percent of the students in the USA, Sweden, Scotland, New Zealand, Hong Kong, Finland,

England and Wales, Canada (both Ontario and British Columbia) Belgium (both French and Flemish) report using calculators in all three places, namely at home, in mathematics class and in other classes. More than 90 percent of the students in Sweden and England and Wales use calculators in mathematics class and over 80 percent in these two countries use them in other classes. These two countries report similarly high percentages using calculators at home. Contrast this with Israel where no one reports using a calculator in mathematics classes and Japan where only 5 percent of the students report this use. Only about 10 percent of the students in Japan, Thailand and Hungary report using programmable calculators in other classes. Only 16 percent of students in Hungary and 20 percent of Japanese students report home use of the programmable calculator (in Japan 60 percent of the students report they use four-function calculators at home).

Also of interest here is the fact that only three countries (Japan, Hong Kong and Thailand) report any significant use of the abacus. For all three countries both Population A and Population B students reported using the abacus at home only. Apparently, this traditional calculation device receives no usage in the schools.

For the computer, 10 percent of the Japanese Population A students report using it at home while for all other countries the percentage is considerably lower. Otherwise, very little use is made of the computer at this level. For Population B, 22 percent of the students in Sweden report using the computer in mathematics class. Nineteen percent of USA students, 14 percent of Swedish students, 13 percent of students from New Zealand and 10 percent of English students report using computers in other classes. For all other countries and categories of use the percentage is less than 10 percent. It is clear very little use was yet being made of computers either at home or at school in 1981.

Data on the types of uses made of calculators by students are presented in Table 4 and shown in Figures 7 and 8. For Population A the most popular use of the calculator among students was for checking answers and the second most popular use was for doing homework. Contrast this with what the teachers said they encouraged. Teachers encouraged using calculators or checking answers followed by using them for recreation. Using calculators for doing homework was next to the lowest in order of priority of use among the teachers.

For Population B, using calculators for doing homework followed by problem solving was given the highest priority whereas the teachers had indicated they encouraged problem solving followed by homework. Both students and teachers agreed that using a calculator for recreation was lowest in priority of their uses for the calculator. Note the relatively consistent lower use of the calculator in these varied areas by students in Japan, Hungary and Thailand as compared with other countries. The reverse (consistently high use of calculators for varied purposes) is true for students in French Belgium except for doing projects where no student reports using a calculator.

5. Attitudes Towards Calculators and Computers

Student attitudes toward calculators and computers were measured by asking them to indicate their agreement with statements such as the following.

Sample Statement 1: Using a hand-held calculator can help you learn many different mathematical topics.

As is shown in Table 5, about one-third of the Population A students in most countries endorsed this statement but the Population B student response pattern was much more varied.

Sample Statement 2: Everyone should learn something about computers.

As Table 6 reports, a very large percentage of Population B students endorse this statement but a smaller percentage of Population A students do so.

These data are graphed in Figures 9 and 10.

There seems to be some relationship within Population B between frequent use of calculators and opinions held about the usefulness of the calculator for learning mathematical topics. In Sweden, where the most frequent use of calculators is reported, students also seemed to be most positive in their opinions. With the exception of Hong Kong, where only occasional high use of calculators was reported, all countries reporting high percentages of positive attitudes also reported high use of calculators. In countries where low percentages of students endorsing the usefulness of the calculator were reported, teachers reported little or no use of the calculators. An exception (such as Japan and Hungary) was New Zealand where few endorsed the usefulness of the calculator but reported high frequent use. This would suggest that there is some relationship between greater use of the calculator and more positive opinions on calculator use.

No such relationship is apparent in the data on computers. It may be that at the time of the study so little use was made of computers in most countries that little influence was yet exerted.

On the whole, student attitudes toward the use of calculators and computers were positive. Population B students were more positive towards using computers and calculators than were Population A students. Population A students in French Belgium and Ontario, Canada were more positive towards using calculators than were those in other countries. Population A students in Canada (British Columbia) and the USA were more positive towards the use of computers than were their counterparts in other countries. Population A students in Japan were less positive towards the use of computers than were students in other countries.

Within Population B, differences in opinion were not very clearly seen between countries. But these advanced mathematics students were more firmly convinced that it was more fun to learn mathematical ideas when using a hand-held calculator than they were about the usefulness of calculators for mathematical topics, the importance of learning to compute when using a calculator or that it's more fun to solve word problems when using a hand-held calculator. With respect to the computer, the advanced students tended to feel that using computers makes learning mathematics mechanical and boring. They tended to strongly agree that everyone should learn about computers and that computers do lots of good things for people. (See Table 4.)

The Population B students were asked to indicate whether using a hand-held calculator was an activity they liked, found hard, and was important. On the whole, they were quite positive towards use of the calculator. Students in Thailand, Japan and French Belgium were considerably less positive than those in other countries. In the case of Thailand, more students held negative views about using calculators than did students in other countries. Even so, 55 percent of the Thai Population B students liked using a hand-held calculator, 84 percent felt it was easy and 39 percent saw this use as important (note however that 53 percent saw it as unimportant. Students in Hungary also held this markedly different view from that expressed by the majority (65 percent not important; 23 percent important). In the two countries where there was little use of the calculators among Population B student (Japan and Thailand) students held less positive attitudes towards calculators. The reverse (countries where frequent use was made holding more positive views) was not apparent. Taking the populations as a whole it appears that Population B, which made greater use of calculators, also held more positive views than Population A, which made much less use of the calculators.

6. Summary

During 1980-1982, (the time the data were collected) very limited use was made of the calculator among Population A students. School policy at this level was somewhat restrictive. When students did use calculators, they tended to use them at home for doing homework, checking answers and for recreational purposes. One wonders if teachers at this level were concentrating on computational skills and therefore felt calculators might prove detrimental to this development. For whatever the reason, Population A made less use of calculators than Population B. Even among Population B it was not a large majority who made use of the calculator. School policy and teacher encouragement were much more positive for this group. The Population B students tended to use the programmable calculator both at home and at school though on the whole home use was more extensive. They tended to use calculators for problem solving and doing homework with recreation the least popular use.

Within Population B, Sweden and Canada (Ontario) made greater use of calculators than did the other countries. Japan, Hungary and Thailand made much less use of calculators than the other countries. Only Sweden, the USA and New Zealand made much use of the computer with the USA reporting the greatest use in other classes and Sweden reporting the greatest use of mathematic classes. Attitudes on the whole were only slightly more positive than negative towards using calculators and computers. Population B was more positive towards that use than Population A. Other than in terms of the whole population there seemed little relationship between attitudes and extensiveness of use of calculators.

Thus emerge the five major findings:

1) Population B students use calculators and computers more than do Population A students.

2) Within Population B, Sweden and Canada (Ontario) make greater use of calculators than other countries while the USA, Sweden and New Zealand make greater use of computers than other countries.

3) School policies encouraging the use of calculators are more in evidence in Population B than in Population A, yet a very high percentage of schools have no policy in this regard.

4) Population A students use calculators mainly at home for homework, checking answers and recreation while Population B students use them both at home and school mainly for problem solving and doing homework.

5) Population B students had more positive attitudes towards the use of calculators and computers than Population A students.

Table 1
Teacher Use of Calculators: By Population
(Percentage of Teachers)

Country	Extent of Use				
	Frequently (one or more periods per week)	Occasionally	Never	Not Allowed	No Response
POPULATION A: Four-Function Calculators					
Belgium (Flemish)	1	8	50	39	5
Belgium (French)	7	23	66	0	5
Canada (BC)	2	36	22	31	8
Canada (Ontario)	10	34	24	28	8
England and Wales	5	33	34	19	9
Finland	0	18	50	25	5
France	1	36	43	16	8
Hong Kong	3	12	83	1	2
Hungary	--	--	--	--	100
Israel	11	14	0	0	77
Japan	1	3	86	11	1
Luxembourg	3	31	27	24	15
Netherlands	2	10	32	52	4
New Zealand	2	27	45	24	5
Nigeria	11	11	36	29	15
Scotland	2	13	23	59	3
Swaziland	4	4	88	0	4
Sweden	10	58	11	1	20
Thailand	0	1	71	15	13
USA	6	29	33	30	2
POPULATION B: Programmable Calculators					
Belgium (Flemish)	59	30	7	0	12
Belgium (French)	59	23	7	0	12
Canada (BC)	42	26	4	2	25
Canada (Ontario)	57	25	4	3	19
England and Wales	78	13	3	1	8
Finland	42	15	10	1	32
Hong Kong	22	46	14	0	18
Hungary	4	16	32	0	48
Israel	53	13	22	0	13
Japan	0	5	88	4	2
New Zealand	54	34	3	0	9
Scotland	60	22	1	0	17
Sweden	95	1	0	0	4
Thailand	8	8	27	0	56
USA	48	23	13	0	17

Table 2
School Policy and Use of Calculators: By Population

Country	Percent Reporting					
	No Policy	Calculator Forbidden	Limited Use	Frequent Use	Calculator Unavailable	No Response
POPULATION A: Four-function Calculators						
Belgium (Flemish)	23	53	13	3	6	2
Belgium (French)	45	15	32	4	0	4
Canada (BC)	48	24	16	1	4	7
Canada (Ontario)	51	15	14	3	16	1
England and Wales	28	20	41	9	2	1
Finland	22	16	34	3	23	1
France	32	9	23	4	20	13
Hong Kong	22	45	15	0	8	10
Hungary	17	21	11	0	46	4
Israel	23	5	19	2	23	27
Japan	23	24	46	1	6	0
Luxembourg	52	17	26	0	2	2
Netherlands	19	58	16	3	0	4
New Zealand	41	9	40	4	6	0
Nigeria	7	55	10	0	24	5
Scotland	4	67	16	1	5	7
Swaziland	25	4	4	0	58	8
Sweden	14	1	40	25	1	19
Thailand	13	29	14	0	39	5
USA	52	13	18	1	15	2
POPULATION B: Programmable Calculators						
Belgium (Flemish)	19	0	43	34	2	1
Belgium (French)	32	0	39	15	10	4
Canada (BC)	28	1	59	5	1	5
Canada (Ontario)	16	1	77	0	3	3
England and Wales	12	4	73	5	4	2
Finland	16	6	60	6	11	0
Hong Kong	28	6	51	0	6	9
Hungary	22	7	30	2	37	1
Israel	20	0	58	8	0	14
Japan	35	12	42	4	4	3
New Zealand	23	0	70	4	4	0
Scotland	7	9	76	2	2	4
Sweden	2	0	18	79	0	2
Thailand	30	6	23	2	27	13
USA	56	3	27	5	7	2

Table 3
Where Calculators are Used by Students: 1981

Country	Percent Reporting					
	Home	Mathematics Class	Other Classes	All	None	No Response
POPULATION A: Four Function Calculator						
Belgium (Flemish)	33	3	4	1	15	80
Belgium (French)	47	8	9	2	0	51
Canada (BC)	3	3	3	3	0	97
Canada (Ontario)	65	29	9	7	30	3
England and Wales	46	15	8	4	43	6
Finland	24	7	4	1	0	70
France	69	11	4	2	0	33
Hong Kong	37	6	5	2	0	60
Hungary	13	2	1	1	0	89
Israel	24	0	6	0	59	19
Japan	43	3	4	0	0	52
Luxembourg	43	7	3	1	31	25
Netherlands	36	7	8	3	0	60
New Zealand	43	14	8	5	52	5
Nigeria	2	1	1	0	0	97
Scotland	38	10	3	1	0	57
Swaziland*	--	--	--	--	--	100
Sweden	27	46	2	1	34	7
Thailand	28	5	4	1	0	68
USA	23	25	9	5	33	40
POPULATION B: Programmable/Scientific						
*Belgium (Flemish)	42	19	16	47	0	2
*Belgium (French)	34	17	18	47	0	12
Canada (BC)	59	57	55	49	0	36
Canada (Ontario)	61	62	55	51	28	35
England and Wales	92	90	80	77	6	5
Finland	66	66	51	48	0	31
Hong Kong	76	68	69	63	0	22
Hungary	16	8	10	5	61	21
Israel	55	0	44	0	12	22
Japan-	20(60)	5(2)	11(16)	2(3)	0(0)	73(31)
New Zealand	67	64	62	52	0	27
Scotland	73	70	62	57	0	24
Sweden	89	93	82	79	0	6
Thailand	29	16	11	5	0	60
USA	64	69	55	43	20	24

*Population B students reporting use of four-function calculator only.
-Population B students reporting greater use of four-function calculator, percentages for four-function calculator given in parentheses.
All students reporting this use whether only or in combination with other categories of use except for those reporting all three.

Table 4
Uses Made of Calculators by Students: 1981

Country	Percent Reporting*					
	Checking Answers	Problem Solving	Taking Tests	Doing Projects	Recrea-tion	Doing Homework
POPULATION A						
Belgium (Flemish)	28	14	3	8	22	36
Belgium (French)	83	81	80	0	81	89
Canada (BC)	31	37	5	22	35	39
Canada (Ontario)	54	33	4	5	4	11
England and Wales	51	43	11	18	20	43
Finland	28	26	17	18	27	34
France	37	18	6	0	13	73
Hong Kong	35	25	8	13	36	21
Hungary	5	3	1	0	1	10
Israel	31	21	11	27	34	21
Japan	24	14	5	10	15	23
Luxembourg	77	72	68	0	70	89
Netherlands	40	23	12	21	24	34
New Zealand	32	33	5	16	40	35
Nigeria	4	5	4	4	5	6
Scotland	23	26	7	10	11	29
Swaziland	19	21	21	18	14	22
Sweden	39	63	21	14	36	38
Thailand	17	14	5	11	37	21
USA	35	40	9	21	26	42
POPULATION B						
Belgium (Flemish)	27	58	52	0	11	97
Belgium (French)	93	95	94	0	86	99
Canada (BC)	43	93	76	58	30	93
Canada (Ontario)	77	56	23	19	7	17
England and Wales	44	96	87	46	24	97
Finland	73	95	97	68	78	96
Hong Kong	20	93	96	82	69	97
Hungary	19	44	6	0	2	52
Israel	71	67	71	67	59	70
Japan	35	31	3	3	22	47
New Zealand	45	92	69	63	31	93
Scotland	25	85	74	22	2	86
Sweden	62	94	94	67	60	92
Thailand	41	39	5	20	17	44
USA	58	79	70	48	27	77

*Percent reported is the combined percentage of students reporting either using a four-function calculator or a scientific/programmable calculator.

Table 5
Students Endorsing the Opinion That Using a Hand-held Calculator Can Help You Learn Many Different Mathematics Topics: 1981

Country	Percent Endorsing	
	Population A	Population B
Belgium (Flemish)	38	28
Belgium (French)	18	47
Canada (BC)	31	34
Canada (Ontario)	19	44
England and Wales	42	--
Finland	45	27
France	37	--
Hong Kong	32	48
Hungary	34	16
Israel	28	35
Japan	38	11
Luxembourg	15	--
Netherlands	36	--
New Zealand	34	12
Nigeria	32	--
Scotland	34	42
Swaziland	--	--
Sweden	27	48
Thailand	28	26
USA	33	41

Table 6
Students Endorsing the Opinion That Everyone Should Learn Something About Computers: 1981

Country	Percent Endorsing	
	Population A	Population B
Belgium (Flemish)	39	47
Belgium (French)	23	87
Canada (BC)	69	80
Canada (Ontario)	88	80
England and Wales	--	33
Finland	45	79
France	34	--
Hong Kong	18	48
Hungary	5	91
Israel	13	56
Japan	21	58
Luxembourg	21	--
Netherlands	24	--
New Zealand	58	71
Nigeria	48	--
Scotland	49	76
Swaziland	--	--
Sweden	42	81
Thailand	72	77
USA	61	84

Table 7
Population B Student Attitudes Toward Calculators

Country	Percent Reporting			Percent Reporting		
	Dislike	Hard	Not Important	Like	Easy	Important
Belgium (Flemish)	9	11	14	73	75	67
Belgium (French)	8	11	15	63	70	65
Canada (BC)	2	0	17	87	96	70
Canada (Ontario)	3	1	10	75	85	68
England and Wales	3	0	18	78	93	62
Finland	2	2	8	89	93	84
Hong Kong	5	1	7	86	91	81
Hungary	12	0	65	71	94	21
Israel	8	1	16	75	91	66
Japan	11	4	33	43	67	23
New Zealand	4	2	20	78	90	59
Scotland	4	1	26	80	94	57
Sweden	3	1	12	81	92	75
Thailand	32	4	53	55	84	39
USA	3	1	9	85	94	79

Response categories were combined as follows:

Dislike: Aggregated from "Dislike" and "Dislike a lot"
Hard: Aggregated from "Hard" and "Very hard"
Not Important: Aggregated from "Not important" and "Not at all important"
Like: Aggregated from "Like" and "Like a lot"
Easy: Aggregated from "Easy" and "Very easy"
Important: Aggregated from "Important" and "Very important"

Appendix I
Sample Sizes for Schools, Teachers and Students

Country	Schools N	Teachers N	Students N
POPULATION A			
Belgium (Flemish)	151	154	1385
Belgium (French)	84	105	2054
Canada (British Columbia)	89	89	2158
Canada (Ontario)	115	173	4885
England and Wales	94	244	2054
Finland	98	206	4484
France	179	347	8329
Hong Kong	125	130	5548
Hungary	70	70	1754
Israel	81	140	3587
Japan	212	212	8091
Luxembourg	42	107	2106
Netherlands	236	236	5500
New Zealand	100	189	5218
Nigeria	42	45	1456
Scotland	76	354	1356
Swaziland	24	25	904
Sweden	97	186	3585
Thailand	98	99	3821
USA	157	276	6683
POPULATION B			
Belgium (Flemish)	131	180	2858
Belgium (French)	79	151	2018
Canada (British Columbia)	78	95	1948
Canada (Ontario)	76	187	3190
England and Wales	312	613	3436
Hong Kong	112	125	3294
Hungary	91	94	2443
Israel	64	82	1810
Japan	192	207	7954
New Zealand	79	79	1186
Scotland	54	218	1501
Sweden	127	127	2712
Thailand	64	107	3747
USA	150	250	4643

Figure 1 Teacher Calculator Use for Population A: 1981

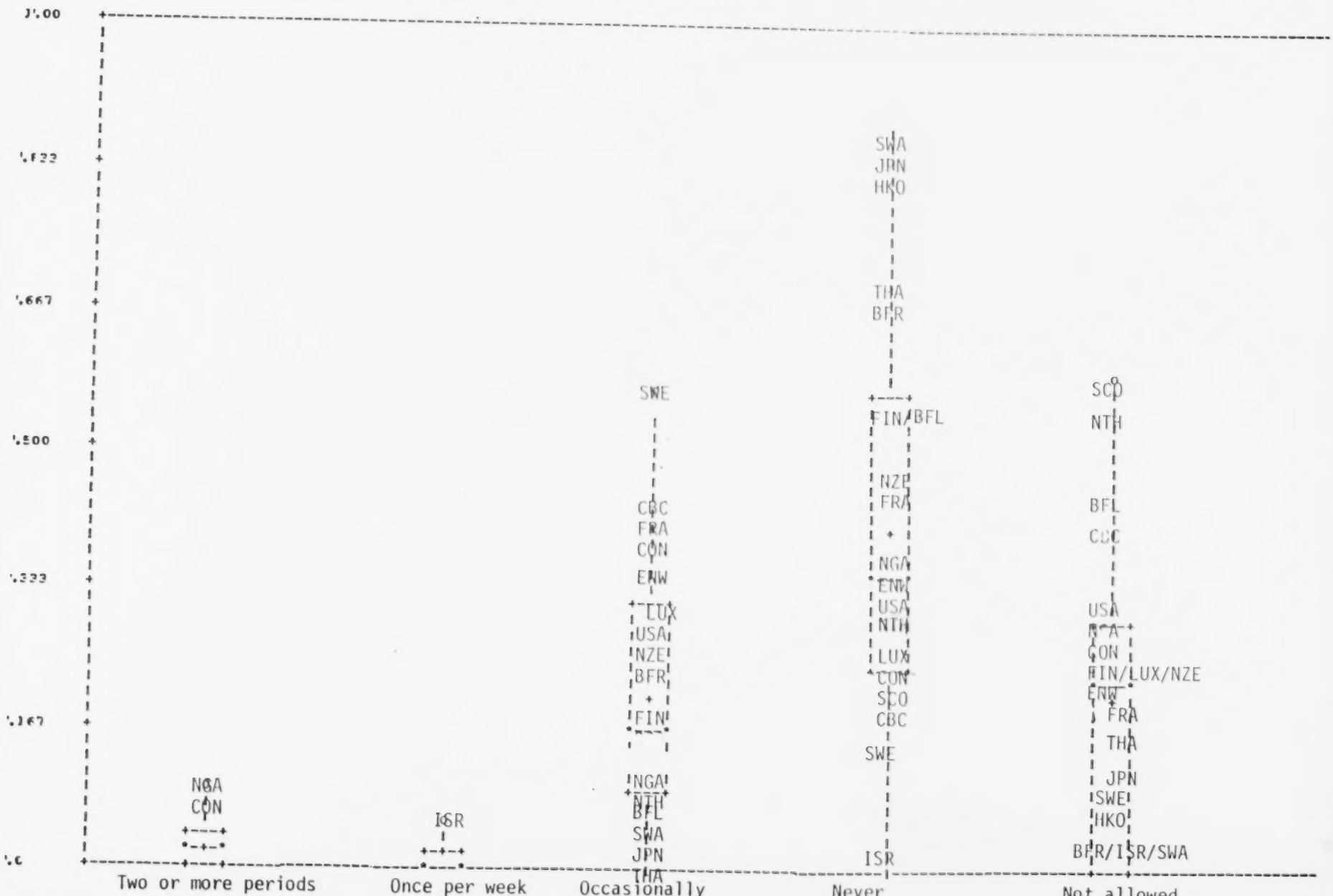


Figure 2 Teacher Calculator Use for Population B: 1981

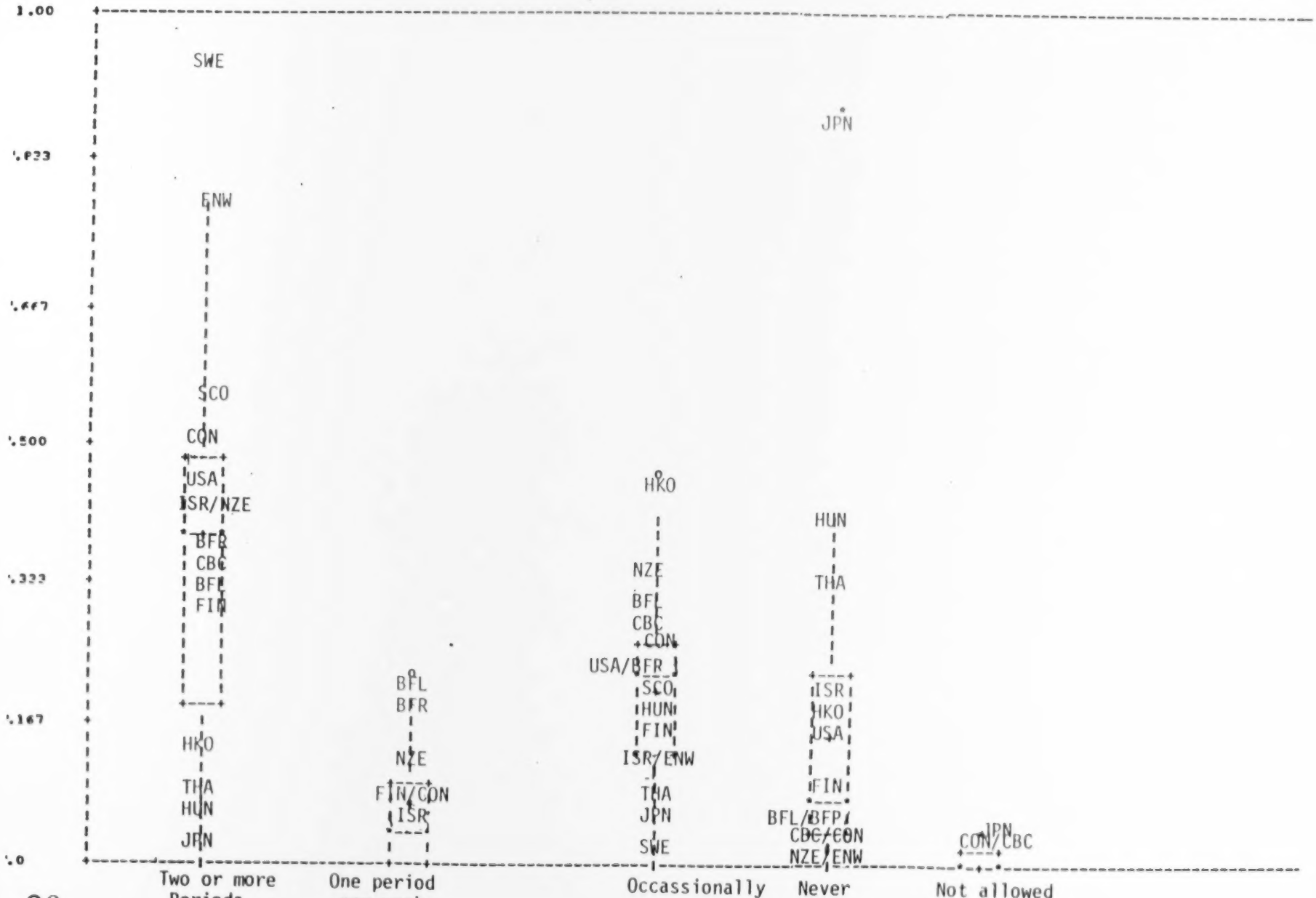


Figure 3 Department Policies on Calculator Use for Population A: 1981

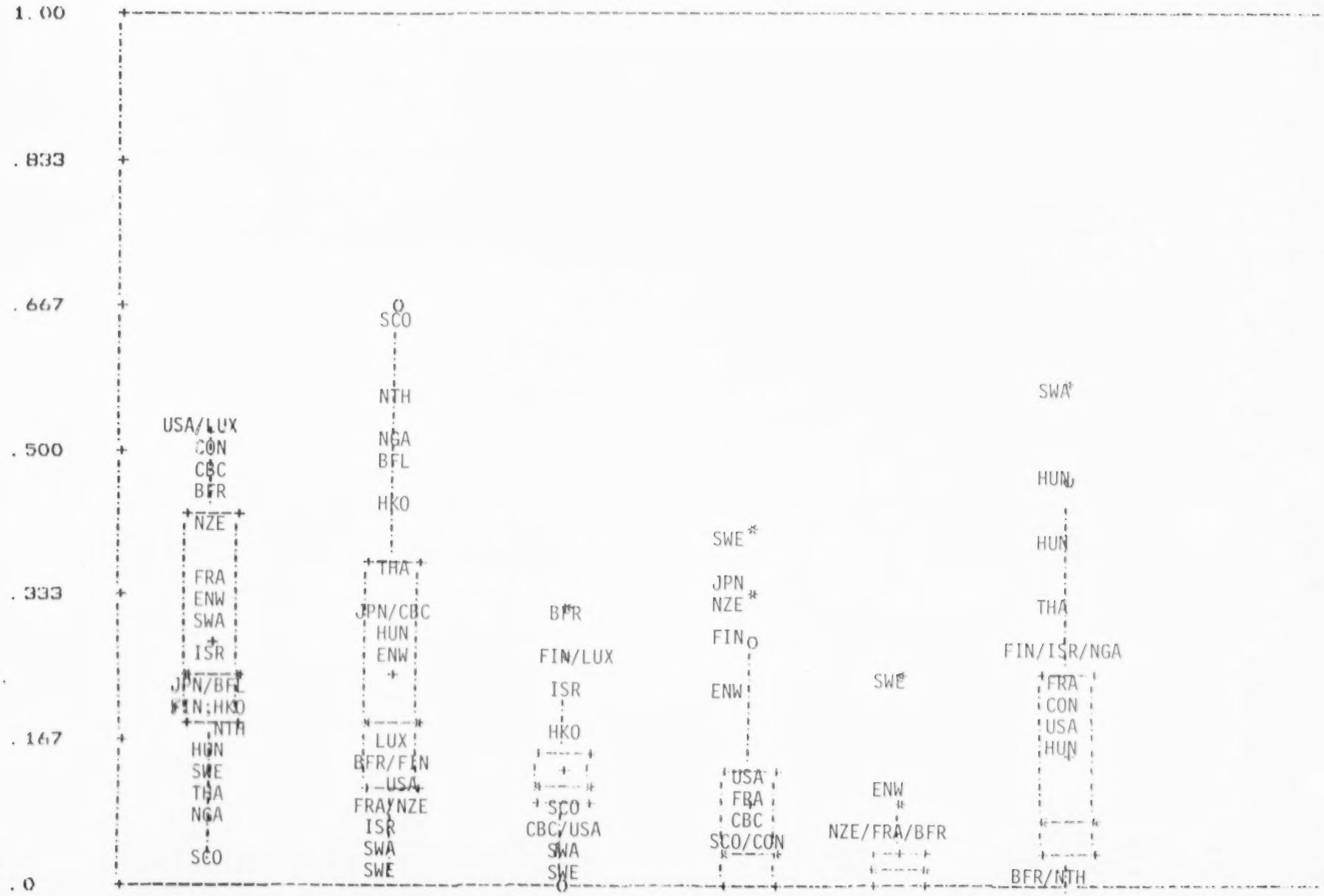


Figure 4 Department Policies on Calculator Use for Population B: 1981

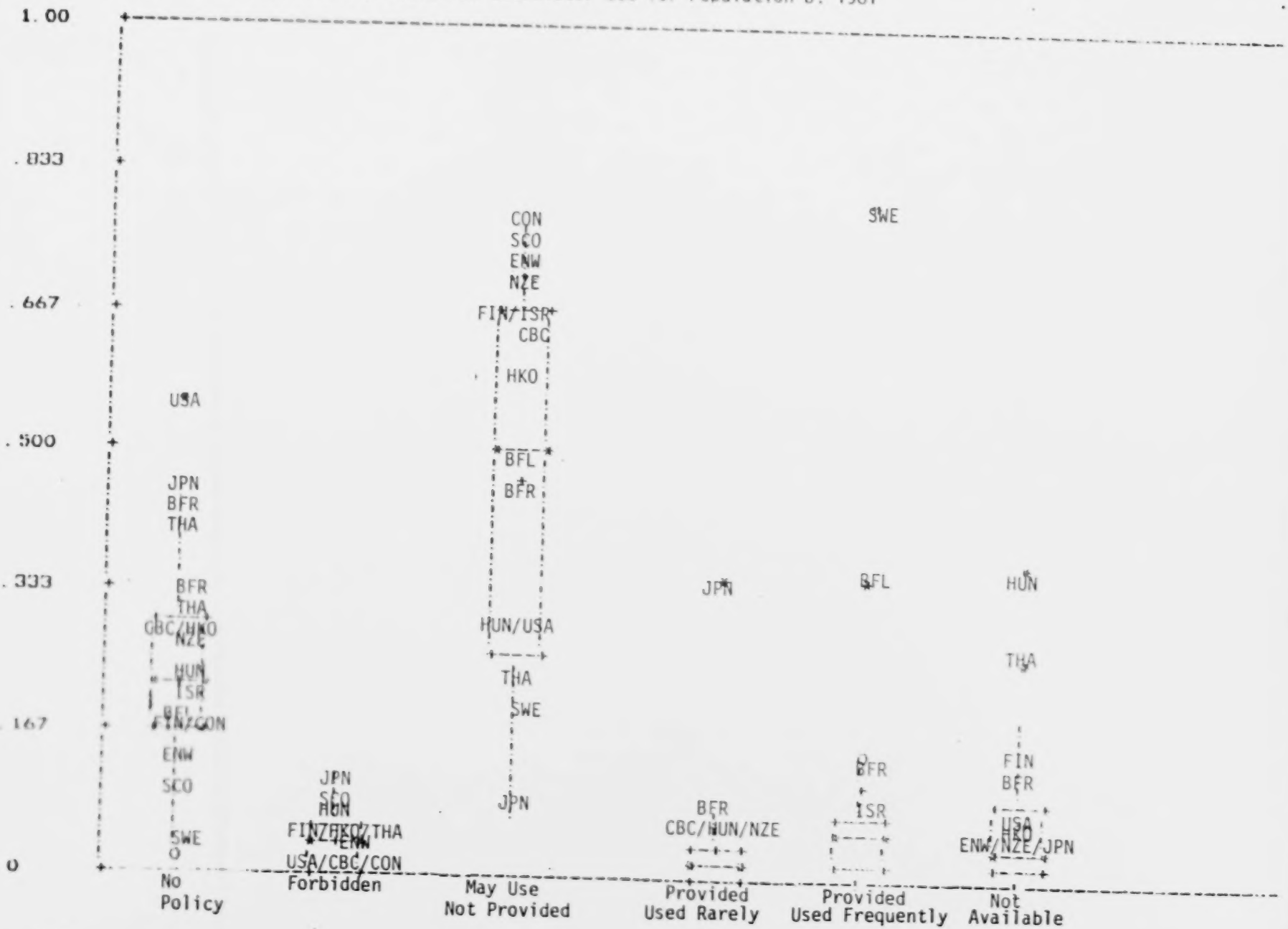


Figure 5 Where Calculators are Used by Population A Students: 1981

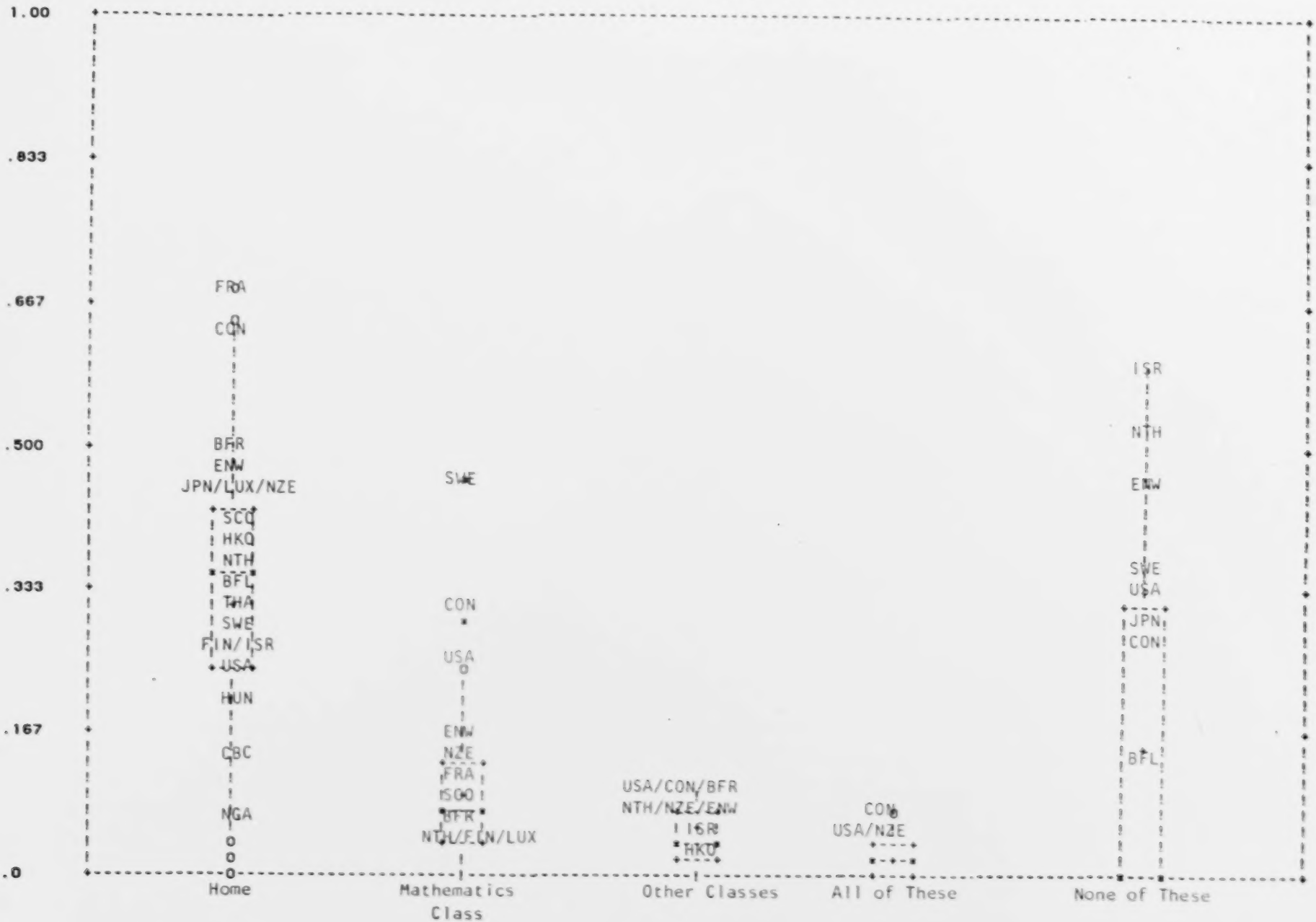


Figure 6 Where Calculators are Used by Population B Students: 1981

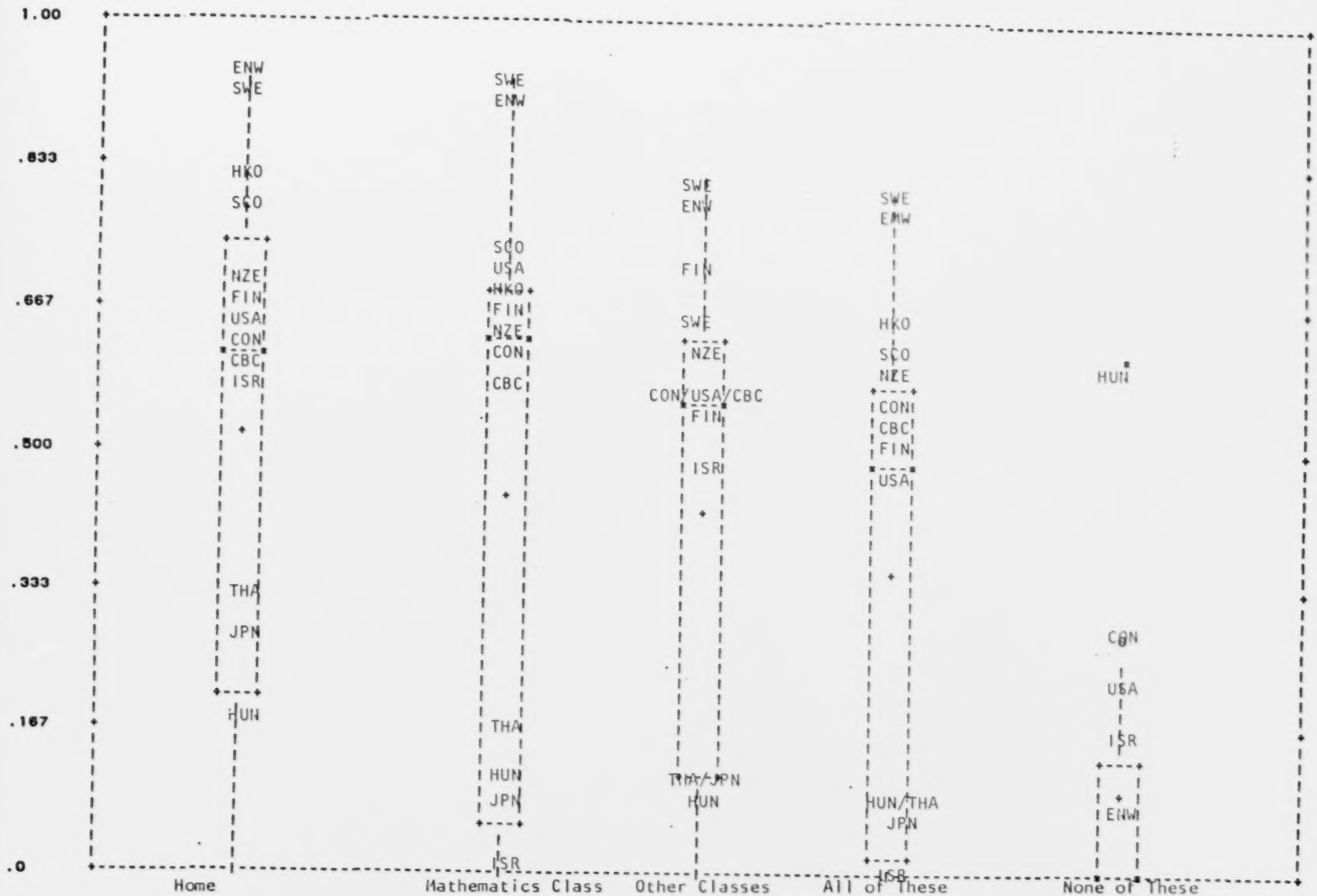


Figure 7 Uses Made of Calculators by Population A Students: 1981

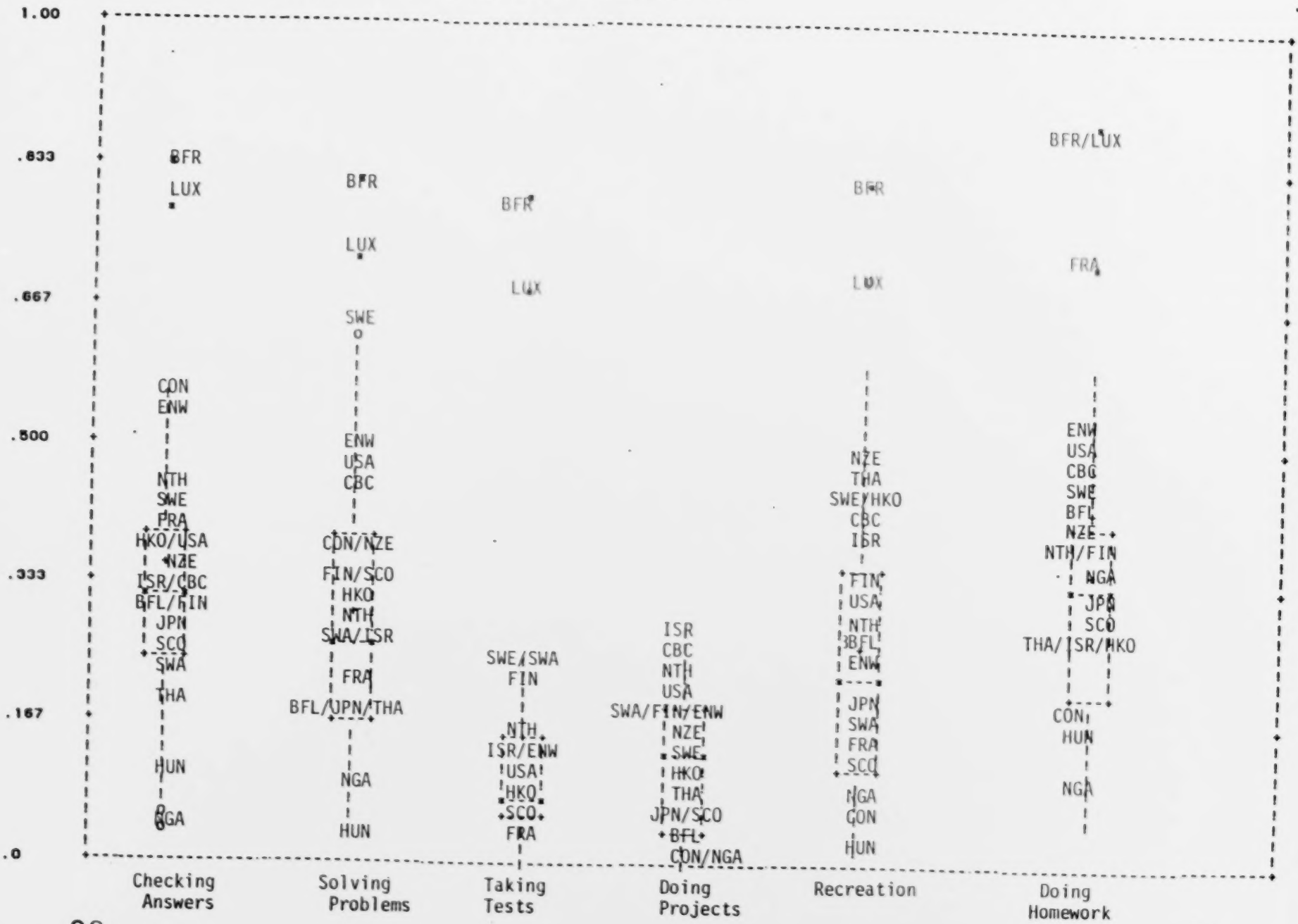
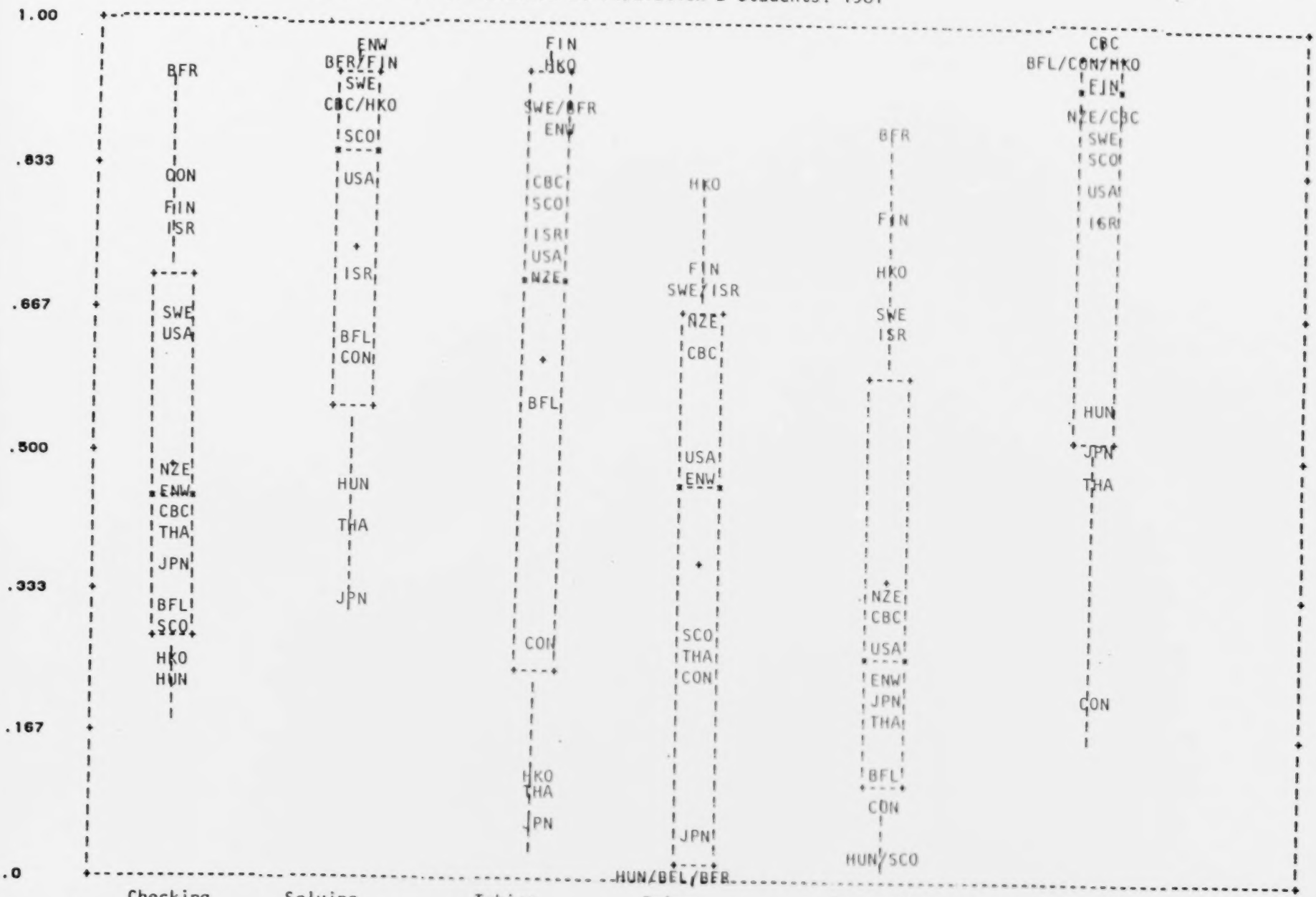


Figure 8 Uses Made of Calculators by Population B Students: 1981



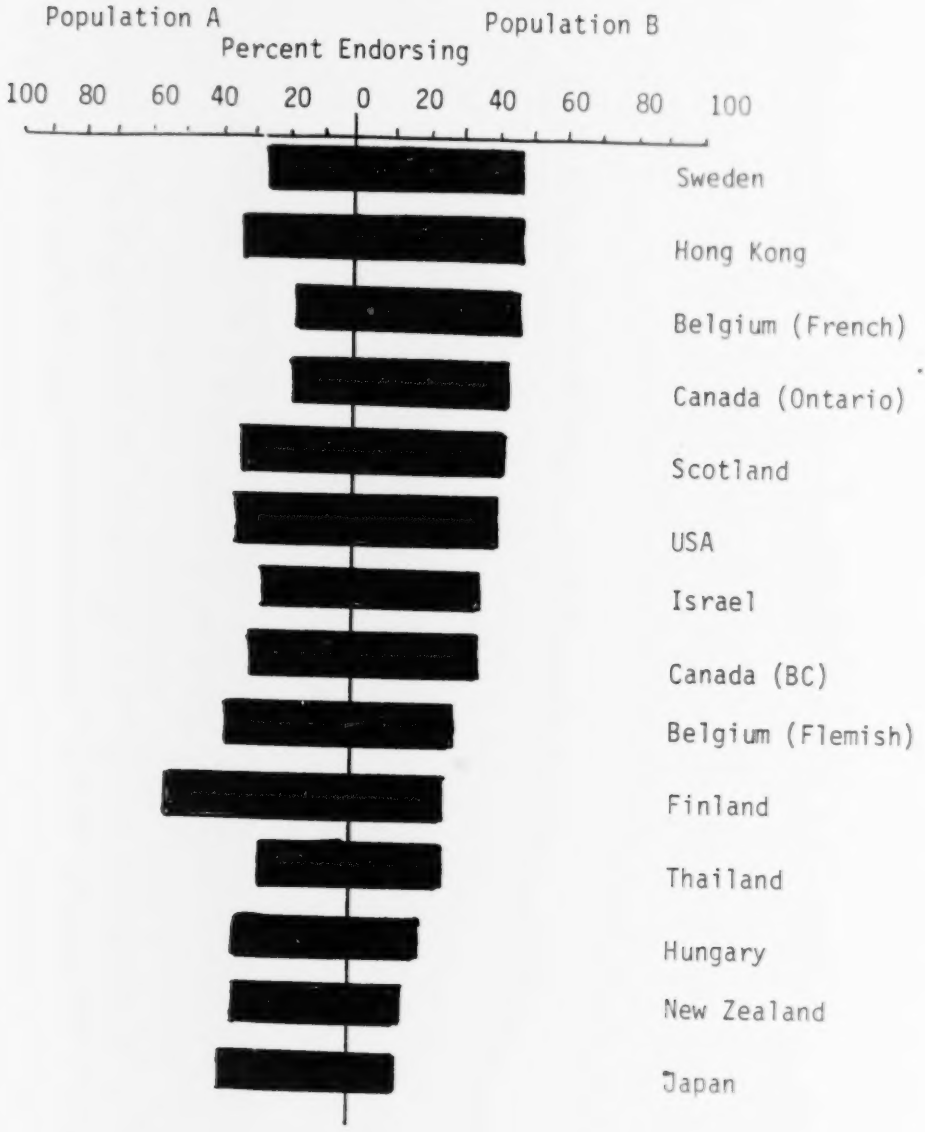


Figure 9 Students Endorsing the Opinion that Using a Hand-held Calculator Can Help You Learn Many Different Mathematics Topics: 1981

*Note: Only countries participating in both Population studies are represented and are arranged accoring to Population B rank.

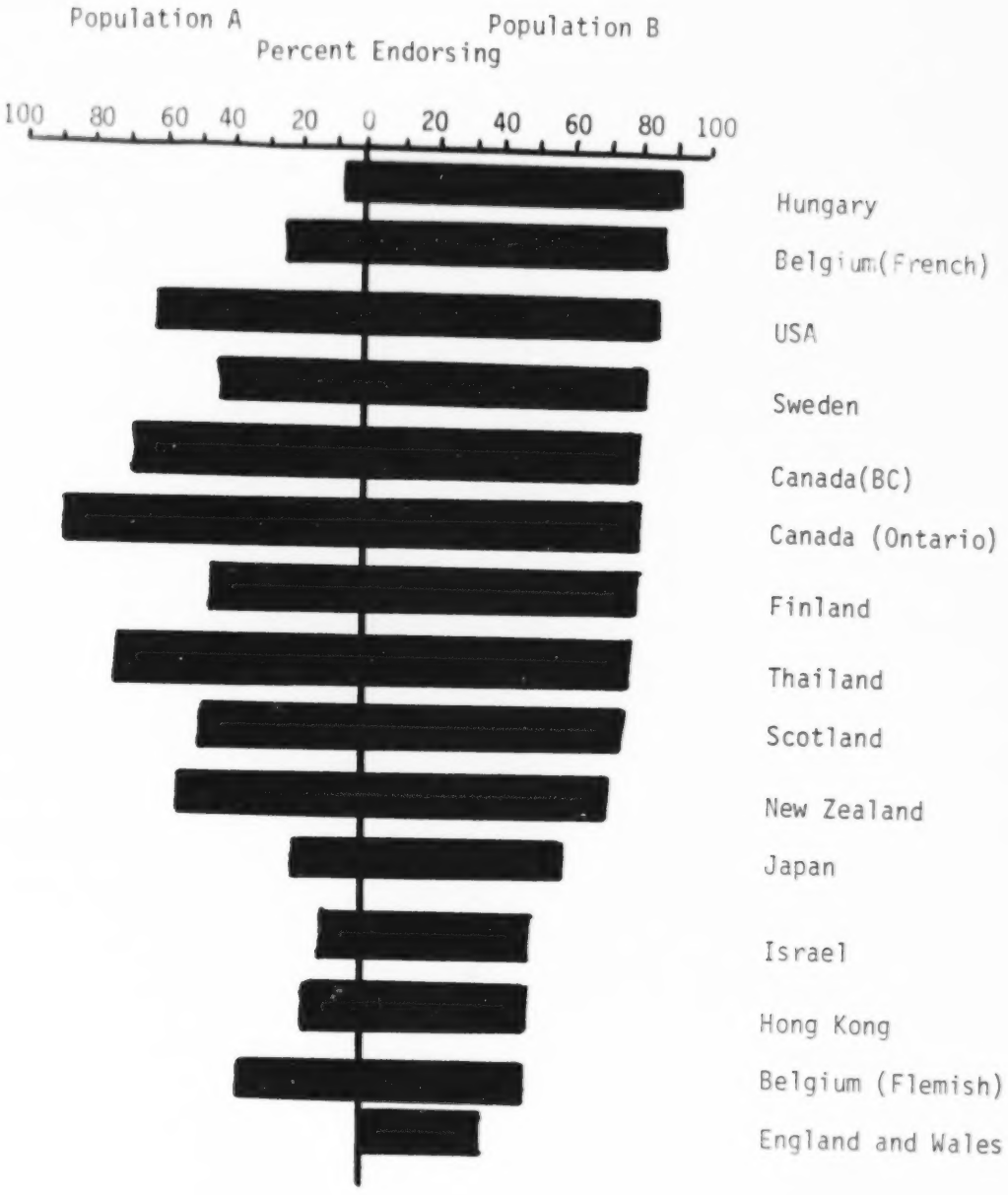


Figure 10 Students Endorsing the Opinion that Everyone Should Learn Something About Computers: 1981

*Note: Only countries participating in both Population studies are represented and are arranged according to Population B rank.